551.590.2

SECTION I.—AEROLOGY.

SOLAR AND SKY RADIATION MEASUREMENTS DURING OCTOBER, 1917.

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[Dated: Weather Bureau, Washington, Nov. 30, 1917.]

For a description of instrumental exposures and an account of the methods of obtaining and reducing the measurements the reader is referred to the REVIEW for January, 1917, **45**:2.

The monthly means and departures from normal values are given in Table 1 show that direct solar radiation averaged above normal intensity at Madison and Santa Fe, and close to normal at Washington and Lincoln.

Table 3 shows a deficiency in the total radiation for the month of nearly 9 per cent at Washington and 14 per cent at Madison as compared with the October normals for these stations.

Skylight polarization measurements obtained at Wash-Ogton on seven days give a mean of 51 per cent with a waximum of 63 per cent. These are below the average tactober values for Washington. The measurements ob-mined at Madison on 3 days give a mean of 67 per cent, niith a maximum of 71 per cent on the 1st.

TABLE 1.—*Solar radiation intensities during October, 1917.*

[Gram-calories per minute per square centimeter of normal surface.]

Washington, D. C.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Oct. 1	.....	1.20	1.11	1.02	0.91	0.80	0.71	0.64	.....	.....
2	.....	1.25	1.21	1.12	1.03	0.96	0.90	0.84	0.79	.....
3	.....	1.27	1.06	0.99	0.93	0.87	0.82	0.77	0.71	0.66
5	.....	1.09	.....	.....	.....	.....	.....	.....	.....	.....
6	.....	1.37	1.24	1.08	0.85	0.72	0.58	0.51	.....	.....
13	.....	1.33	1.25	1.15	1.05	0.97	0.90	0.85	0.82	.....
22	.....	.....	0.96	0.85	0.74	0.65	0.60	0.56	.....	.....
26	.....	1.26	1.01	.....	.....	.....	.....	.....	.....	.....
27	.....	.....	1.08	.....	.....	.....	.....	.....	.....	.....
31	.....	.....	1.14	1.07	0.97	.....	.....	0.82	.....	0.72
Means	.....	1.25	1.12	1.04	0.93	0.83	0.75	0.71	0.77	(0.69)
Departure from 9-year normal	.....	+0.02	+0.01	+0.01	±0.00	−0.03	−0.07	−0.04	+0.01	−0.06
P. M.										
Oct. 2	.....	1.25	0.99	0.94	0.89	0.82	0.76	0.73	0.69	0.65
3	.....	1.28	.....	.....	.....	.....	.....	.....	.....	.....
25	.....	.....	.....	.....	0.80	0.77	.....	.....	.....	.....
31	.....	.....	.....	.....	.....	.....	0.84	0.76	.....	.....
Means	.....	(1.26)	(0.99)	(0.94)	(0.84)	(0.80)	(0.80)	(0.74)	(0.69)	(0.65)
Departure from 9-year normal	.....	+0.02	−0.14	−0.12	−0.07	−0.03	+0.03	+0.02	+0.02	+0.03

TABLE 1.—*Solar radiation intensities during October, 1917*—Continued.

Madison, Wis.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Oct. 1	.....	1.40	1.21	.....	.....	.....	.....	.....	.....	.....
6	.....	1.31	1.27	1.15	1.06	0.99	.....	.....	.....	.....
8	.....	.....	.....	.....	.....	1.14	1.09	1.04	.....	.....
13	.....	.....	1.37	1.30	1.24	1.17	.....	.....	.....	.....
16	.....	1.42	1.28	1.24	1.16	1.08	1.01	.....	.....	.....
27	.....	1.37	.....	.....	.....	.....	.....	.....	.....	.....
Monthly means	.....	1.38	1.28	1.23	1.15	1.10	(1.05)	(1.04)	.....	.....
Departure from 8-year normals	.....	+0.13	+0.12	+0.14	+0.12	+0.16	+0.20	+0.31	.....	.....
P. M.										
Oct. 1	.....	1.41	.....	.....	.....	.....	.....	.....	.....	.....
15	.....	.....	1.28	1.18	1.11	1.04	0.98	0.93	.....	.....
16	.....	.....	1.18	.....	.....	0.93	.....	.....	.....	.....
Means	.....	(1.41)	(1.23)	(1.18)	(1.11)	(0.98)	(0.98)	(0.93)	.....	.....
Departures from 8-year normals	.....	+0.09	+0.07	+0.09	+0.11	+0.01	+0.03	+0.13	.....	.....

Lincoln, Nebr.

A. M.										
Oct. 9	.....	1.31	1.24	1.19	.....	.....	.....	.....	.....	.....
11	.....	.....	.....	.....	.....	0.95	.....	.....	.....	.....
12	.....	1.50	1.44	1.38	1.28	1.20	1.12	1.04	0.96	.....
13	.....	1.21	1.21	1.16	1.07	0.98	.....	.....	.....	.....
15	.....	1.25	1.16	1.06	1.00	0.88	.....	.....	.....	.....
26	.....	.....	1.37	1.31	1.23	.....	.....	.....	.....	.....
27	.....	1.40	1.31	1.21	1.13	1.06	0.98	.....	.....	.....
Means	.....	1.33	1.29	1.22	1.14	1.01	(1.05)	(1.04)	(0.96)	.....
Departure from 3-year normal	.....	−0.04	−0.02	−0.02	−0.02	−0.06	+0.03	+0.09	+0.06	.....
P. M.										
Oct. 2	.....	1.18	.....	.....	.....	.....	.....	.....	.....	.....
3	.....	1.22	1.10	1.01	0.95	0.89	0.83	0.78	0.72	0.67
4	.....	1.28	1.20	1.11	1.03	0.96	0.91	0.87	.....	.....
10	.....	1.31	1.20	.....	.....	.....	.....	.....	.....	.....
12	.....	1.50	1.39	1.25	1.06	.....	.....	.....	.....	.....
14	.....	1.29	1.16	1.05	0.95	.....	.....	.....	.....	.....
15	.....	.....	1.17	1.09	1.01	0.95	0.89	0.83	0.78	0.73
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.92
23	.....	.....	1.22	.....	.....	1.09	1.06	1.02	.....	.....
27	.....	.....	1.23	.....	.....	.....	.....	.....	.....	.....
31	.....	.....	1.34	.....	.....	.....	.....	.....	.....	.....
Means	.....	1.30	1.22	1.10	1.00	0.97	0.92	0.88	(0.75)	0.77
Departure from 3-year normal	.....	−0.06	−0.02	−0.06	−0.08	−0.06	−0.05	−0.04	−0.11	−0.07

TABLE 1.—*Solar radiation intensities during October, 1917*—Continued

Santa Fe, N. Mex.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Oct. 5	.....	.....	.....	.....	1.24	1.19	1.13	1.08	1.06	.....
9	.....	1.57	.....	1.37	1.29	1.27	1.21	1.15	1.07	.....
15	.....	1.50	.....	.....	.....	1.21	1.15	1.09	1.04	.....
16	.....	1.49	.....	.....	1.21	1.15	1.11	1.06	.....	.....
18	.....	1.50	1.40	.....	.....	1.17	1.10	1.03	0.97	0.91
19	.....	1.52	1.45	1.40	1.34	1.30	1.25	1.21	1.17	1.14
20	.....	1.53	1.45	1.39	1.33	1.27	1.27	1.22	1.18	1.13
22	.....	1.48	1.44	1.40	.....	1.34	1.29	1.22	1.15	.....
27	.....	1.51	1.38	1.31	1.25	1.20	.....	.....	1.09	.....
30	.....	1.53	1.44	.....	.....	1.31	.....	.....	1.24	.....
Means	.....	1.51	1.43	1.37	1.28	1.24	1.19	1.13	1.11	1.06
Departure from 5-year normal	.....	+0.03	+0.06	+0.05	+0.05	+0.06	+0.04	−0.01	+0.01	−0.02
P. M.										
Oct. 8	.....	.....	1.39	1.27	1.26	1.17	.....	.....	.....	.....
9	.....	1.52	1.46	1.39	1.32	1.25	1.18	1.13	.....	.....
11	.....	1.52	1.41	1.31	1.24	1.18	1.13	.....	.....	.....
16	.....	.....	1.42	1.34	1.27	1.21	.....	.....	.....	.....
18	.....	1.47	1.34	.....	.....	.....	.....	.....	.....	.....
19	.....	1.49	.....	1.32	1.23	.....	1.13	.....	.....	.....
20	.....	.....	1.42	.....	.....	.....	.....	.....	.....	.....
22	.....	.....	1.39	.....	.....	.....	.....	.....	.....	.....
27	.....	.....	1.34	.....	.....	.....	.....	.....	.....	.....
30	.....	.....	1.45	1.38	1.32	1.25	1.20	1.15	1.11	.....
Means	.....	1.50	1.40	1.34	1.27	1.21	1.16	(1.14)	(1.11)	.....
Departure from 2-year normal	.....	+0.03	+0.02	+0.04	+0.04	+0.06	+0.07	+0.13	+0.26	.....

TABLE 2.—*Vapor pressures at pyrheliometric stations on days when solar radiation intensities were measured.*

Washington, D. C.			Madison, Wis.			Lincoln, Nebr.			Santa Fe, N. Mex.		
Dates.	8 a.m.	8 p.m.	Dates.	8 a.m.	8 p.m.	Dates.	8 a.m.	8 p.m.	Dates.	8 a.m.	8 p.m.
1917.	mm.	mm.	1917.	mm.	mm.	1917.	mm.	mm.	1917.	mm.	mm.
Oct. 1	6.76	6.02	Oct. 1	6.02	6.50	Oct. 2	7.87	8.18	Oct. 5	5.79	4.95
2	6.76	7.29	6	4.95	4.95	3	7.04	8.48	8	5.16	5.56
3	7.57	9.14	8	3.63	3.30	4	7.87	7.29	9	4.95	3.63
5	10.59	10.97	13	2.62	3.63	9	6.76	4.37	11	3.00	4.17
6	6.50	4.75	15	4.37	4.57	10	4.57	4.95	15	3.63	4.95
13	3.81	5.56	16	3.99	3.99	11	5.16	2.36	16	4.17	4.17
22	4.95	5.36	27	3.81	3.45	12	2.26	1.52	18	2.36	1.60
25	5.16	5.36	.....	.....	.....	13	3.15	4.57	19	2.16	2.74
26	5.36	7.57	.....	.....	.....	14	3.81	5.16	20	2.74	3.15
27	7.57	12.24	.....	.....	.....	15	5.16	5.16	23	2.36	3.63
31	2.62	3.30	.....	.....	.....	22	3.81	3.45	27	2.36	2.87
						23	2.87	2.74	30	1.78	2.36
						26	3.63	6.02	.....	.....	.....
						27	3.15	3.99	.....	.....	.....
						31	2.49	2.74	.....	.....	.....

TABLE 3.—*Daily totals and departures of solar and sky radiation during October, 1917.*

[Gram-calories per square centimeter of horizontal surface.]

Day of month.	Daily totals. Washington.	Madison.	Departures from normal. Washington.	Madison.	Excess or deficiency since first of month. Washington.	Madison.
1917.	calories.	calories.	calories.	calories.	calories.	calories.
Oct. 1	307	422	−33	137	−33	137
2	442	292	106	11	73	148
3	424	146	92	−132	165	16
4	356	290	28	16	193	32
5	292	203	−32	−68	161	−36
6	344	376	23	108	184	72
7	414	339	95	74	279	146
8	231	345	−85	84	194	230
9	58	61	−255	−197	−61	33
10	242	142	−69	−113	−130	−80
11	278	27	−30	−225	−160	−305
12	104	90	−202	−159	−362	−464
13	414	310	111	64	−251	−400
14	401	286	100	43	−151	−357
15	363	361	65	121	−86	−236
16	297	344	1	107	−85	−129
17	349	48	55	−186	−30	−315
18	71	46	−220	−186	−250	−501
19	144	117	−145	−112	−395	−613
20	379	91	92	−135	−303	−748
Decade departure					−173	−668
21	384	270	99	47	−204	−701
22	336	167	48	−53	−156	−754
23	215	231	−65	13	−221	−741
24	48	281	−230	66	−451	−675
25	291	268	15	56	−436	−619
26	336	38	62	−172	−374	−791
27	294	239	22	31	−352	−760
28	333	60	63	−146	−289	−906
29	88	94	−180	−110	−469	−1,016
30	81	192	−185	−10	−654	−1,026
31	292	224	27	23	−627	−1,003
Decade departure					−324	−255
Excess or deficiency since first of year (calories					−6,608	+677
Excess or deficiency since first of year (per cent					−5.6	+0.6

ATMOSPHERIC OPTICAL DISTURBANCES, FALL OF 1911 TO FEBRUARY, 1917.[1]

551.59.3

By C. DORNO.

[Davos Observatory, Davos, Switzerland, July, 1917.]

Systematic observations on the polarization of skylight, twilight phenomena, and on Bishop's Ring have been carried on at the Davos Observatory from the Fall of 1911 to February, 1917, in addition to continued pyrheliometric measurements and determinations of solar and sky radiation in many portions of the spectrum.[2] These all agree in showing: The great Katmai disturbance which, in June, 1912, brought to a close a period of exceptionally great purity of our atmosphere, very gradually came to an end toward the close of the year 1914. Even at the beginning of 1915 the atmosphere had not wholly recovered the degree of purity which characterized 1911. In the course of 1915 rapidly disappearing individual disturbances could be recognized; they rapidly increased during the first half of 1916, and in the second half of 1916 led to a new, uninterrupted period of disturbance having a milder character than that of 1912.

In the years 1915 and 1916 Bishop's Ring did not always present the appearance of a silvery white "inner disk" surrounded by a less brilliant bluish-white "outer

[1] Translated for the MONTHLY WEATHER REVIEW from the separate: Atmosphärisch-optische Störungen (Herbst 1911 bis Februar 1917), von *C. Dorno*. Astronom. Nachr., Nr. 4899, August, 1917, Band 205.—C. A., Jr.

[2] There are in course of publication in the Abhandlungen d. Kgl. preuss. Meteorol. Instituts, detailed studies of twilight observations and ring phenomena, accompanied by a large amount of tabulated material. More complete extracts from these studies appeared in the April-Mai and the Juni-Juli issues of the Meteorologische Zeitschrift for 1917. There are still in preparation the chapters on "Himmelshelligkeit und Himmelspolarisation" and "Sonnenstrahlung."